

IN THE CLAIMS:

Please cancel Claims 6-8, 10-16, 22-24, and 26-55.

Please amend the claims as is indicated below:

1. (Amended) A method for detecting disconnection [and occlusion] of a patient tubing system of a pneumatically driven, electronically controlled ventilator system used to provide [for providing] breathing gas to a patient [during the exhalation phase of a breath cycle], [said] an exhalation phase of a breath cycle having a plurality of control intervals, comprising the steps of:

[delivering a flow of breathing gas to a patient during an inspiratory phase of a breath cycle;]

determining an onset of an exhalation phase of said breath cycle;

[suspending gas flow delivery to the patient tubing system during said exhalation phase of said breath cycle;]

monitoring exhalation flow and pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle to determine

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whether a condition indicating disconnection of the patient tubing system has occurred;

[monitoring exhalation pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle to determine whether a condition indicating occlusion of the patient tubing system has occurred;] and

generating a disconnection signal indicating disconnection of the patient tubing system responsive to said exhalation flow and said pressure in said patient tubing system [if said condition indicating occlusion of the patient tubing system has not occurred, and] if said condition indicating disconnection of the patient tubing system has occurred.

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2. (Amended) The method of Claim 1, wherein said tubing system includes an exhalation line, and said step of monitoring exhalation flow and pressure in the patient tubing system comprises sensing pressure and flow in said exhalation line, and declaring disconnection of the patient tubing system has occurred if, during a control interval, the pressure in the exhalation line is [less than or greater than] within a predetermined pressure range, and if exhalation flow is less than a predetermined flow threshold, for a contiguous period of consecutive control intervals within a predetermined initial period of time following onset of an exhalation phase.

3. (Amended) [The method of Claim 1,] A method for detecting

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disconnection of a patient tubing system of a pneumatically driven, electronically controlled ventilator system used to provide breathing gas to a patient, an exhalation phase of a breath cycle having a plurality of control intervals, comprising the steps of:

determining an onset of an exhalation phase of said breath cycle;

monitoring exhalation flow and pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle to determine whether a condition indicating disconnection of the patient tubing system has occurred;

monitoring exhalation pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle to determine whether a condition indicating occlusion of the patient tubing system has occurred; and

generating a disconnection signal indicating disconnection of the patient tubing system responsive to said exhalation flow and said pressure in said patient tubing system if said condition indicating occlusion of the patient tubing system has not occurred, and if said condition indicating disconnection of the patient tubing system has occurred;

wherein said tubing system includes an exhalation line, and said step of monitoring exhalation flow and pressure in the patient tubing system comprises sensing pressure and flow in said exhalation line, and declaring disconnection of the patient tubing system has occurred if, during a control interval, the pressure in the exhalation line is [less than or greater than] within a predetermined pressure range, and if exhalation flow

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is less than a disconnection flow limit threshold based upon a flow target and a predetermined disconnection sensitivity, for a contiguous period of consecutive control intervals within a predetermined initial period of time following onset of an exhalation phase.

4. (Amended) [The method of Claim 1, wherein said tubing system includes an exhalation line, and said step of monitoring exhalation flow and pressure in the patient tubing system comprises sensing flow in said exhalation line,] A method for detecting disconnection of a patient tubing system of a pneumatically driven, electronically controlled ventilator system used to provide breathing gas to a patient, comprising the steps of:
delivering a flow of breathing gas to a patient during an inspiratory phase of a breath cycle;
monitoring a desired flow target of breathing gas; and
declaring disconnection of the patient tubing system has occurred if [a] the desired flow target is greater than or equal to a maximum flow threshold, and the duration of a current inspiration is greater than or equal to a maximum allowed spontaneous inspiration time.

5. (Amended) [The method of Claim 1,] A method for detecting

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Instrument	Frequency	Amplitude	Phase	Time
100 Hz	0.00	0.00	0.00	0.00
200 Hz	0.00	0.00	0.00	0.00
300 Hz	0.00	0.00	0.00	0.00
400 Hz	0.00	0.00	0.00	0.00
500 Hz	0.00	0.00	0.00	0.00
600 Hz	0.00	0.00	0.00	0.00
700 Hz	0.00	0.00	0.00	0.00
800 Hz	0.00	0.00	0.00	0.00
900 Hz	0.00	0.00	0.00	0.00
1000 Hz	0.00	0.00	0.00	0.00
1100 Hz	0.00	0.00	0.00	0.00
1200 Hz	0.00	0.00	0.00	0.00
1300 Hz	0.00	0.00	0.00	0.00
1400 Hz	0.00	0.00	0.00	0.00
1500 Hz	0.00	0.00	0.00	0.00
1600 Hz	0.00	0.00	0.00	0.00
1700 Hz	0.00	0.00	0.00	0.00
1800 Hz	0.00	0.00	0.00	0.00
1900 Hz	0.00	0.00	0.00	0.00
2000 Hz	0.00	0.00	0.00	0.00
2100 Hz	0.00	0.00	0.00	0.00
2200 Hz	0.00	0.00	0.00	0.00
2300 Hz	0.00	0.00	0.00	0.00
2400 Hz	0.00	0.00	0.00	0.00
2500 Hz	0.00	0.00	0.00	0.00
2600 Hz	0.00	0.00	0.00	0.00
2700 Hz	0.00	0.00	0.00	0.00
2800 Hz	0.00	0.00	0.00	0.00
2900 Hz	0.00	0.00	0.00	0.00
3000 Hz	0.00	0.00	0.00	0.00
3100 Hz	0.00	0.00	0.00	0.00
3200 Hz	0.00	0.00	0.00	0.00
3300 Hz	0.00	0.00	0.00	0.00
3400 Hz	0.00	0.00	0.00	0.00
3500 Hz	0.00	0.00	0.00	0.00
3600 Hz	0.00	0.00	0.00	0.00
3700 Hz	0.00	0.00	0.00	0.00
3800 Hz	0.00	0.00	0.00	0.00
3900 Hz	0.00	0.00	0.00	0.00
4000 Hz	0.00	0.00	0.00	0.00
4100 Hz	0.00	0.00	0.00	0.00
4200 Hz	0.00	0.00	0.00	0.00
4300 Hz	0.00	0.00	0.00	0.00
4400 Hz	0.00	0.00	0.00	0.00
4500 Hz	0.00	0.00	0.00	0.00
4600 Hz	0.00	0.00	0.00	0.00
4700 Hz	0.00	0.00	0.00	0.00
4800 Hz	0.00	0.00	0.00	0.00
4900 Hz	0.00	0.00	0.00	0.00
5000 Hz	0.00	0.00	0.00	0.00
5100 Hz	0.00	0.00	0.00	0.00
5200 Hz	0.00	0.00	0.00	0.00
5300 Hz	0.00	0.00	0.00	0.00
5400 Hz	0.00	0.00	0.00	0.00
5500 Hz	0.00	0.00	0.00	0.00
5600 Hz	0.00	0.00	0.00	0.00
5700 Hz	0.00	0.00	0.00	0.00
5800 Hz	0.00	0.00	0.00	0.00
5900 Hz	0.00	0.00	0.00	0.00
6000 Hz	0.00	0.00	0.00	0.00
6100 Hz	0.00	0.00	0.00	0.00
6200 Hz	0.00	0.00	0.00	0.00
6300 Hz	0.00	0.00	0.00	0.00
6400 Hz	0.00	0.00	0.00	0.00
6500 Hz	0.00	0.00	0.00	0.00
6600 Hz	0.00	0.00	0.00	0.00
6700 Hz	0.00	0.00	0.00	0.00
6800 Hz	0.00	0.00	0.00	0.00
6900 Hz	0.00	0.00	0.00	0.00
7000 Hz	0.00	0.00	0.00	

control intervals of said exhalation phase of said breath cycle; and

wherein said tubing system includes an exhalation line, and said step of monitoring exhalation flow and pressure in the patient tubing system comprises sensing flow in said exhalation line from the beginning of an inspiration to the beginning of an exhalation, determining an exhalation volume from the sensed flow from the beginning of the inspiration to the beginning of the exhalation, and declaring disconnection of the patient tubing system has occurred if the exhalation volume is less than the integral of the net flow from the beginning of inspiration to the beginning of exhalation with respect to time, multiplied by a proportional factor and a disconnection sensitivity factor, for three consecutive breaths.

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system comprising:

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[means for delivering a flow of breathing gas to a patient during an inspiratory phase of a breath cycle;]

means for determining an onset of an exhalation phase of said breath cycle;

[means for suspending gas flow delivery to the patient tubing system during said exhalation phase of said breath cycle;]

means for monitoring exhalation flow and pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle to determine whether a condition indicating disconnection of the patient tubing system has occurred;

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[means for monitoring exhalation pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle to determine whether a condition indicating occlusion of the patient tubing system has occurred;] and

means for generating a disconnection signal indicating disconnection of the patient tubing system responsive to said exhalation flow and said pressure in said patient tubing system [if said condition indicating occlusion of the patient tubing system has not occurred, and] if said condition indicating disconnection of the patient tubing system has occurred.

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18. (Amended) The system of Claim 17, wherein said tubing system includes an exhalation line, and said means for monitoring exhalation flow and pressure in the patient tubing system comprises a pressure sensor connected to said exhalation line and a flow sensor connected to said exhalation line, and means for declaring disconnection of the patient tubing system has occurred if, during a control interval, the pressure in the exhalation line is within [less than or greater than] a predetermined pressure range, and if exhalation flow is less than a predetermined flow threshold, for a contiguous period of consecutive control intervals within a predetermined initial period of time following onset of an exhalation phase.

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19. (Amended) [The system of Claim 17,] A system for detecting disconnection of a patient tubing system of a pneumatically driven, electronically controlled ventilator system used to provide breathing gas to a patient, an exhalation phase of a breath cycle having a plurality of control intervals, comprising:

means for determining an onset of an exhalation phase of said breath cycle;

means for monitoring exhalation flow and pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle;

and

wherein said tubing system includes an exhalation line, and said means for monitoring exhalation flow and pressure in the patient tubing system comprises a pressure sensor connected to said exhalation line and a flow sensor connected to said exhalation line, and means for declaring disconnection of the patient tubing system has occurred if, during a control interval, the pressure in the exhalation line is within [less than or greater than] a predetermined pressure range, and if exhalation flow is less than a disconnection flow limit threshold based upon a flow target and a predetermined disconnection sensitivity, for a contiguous period of consecutive control intervals within a predetermined initial period of time following onset of an exhalation phase.

20. (Amended) [The system of Claim 17, wherein said tubing system includes an exhalation line, and said means for monitoring exhalation flow and pressure

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in the patient tubing system comprises a flow sensor connected to said exhalation line,] A system for detecting disconnection of a patient tubing system of a pneumatically controlled ventilator system used to provide a desired flow target of breathing gas to a patient, comprising:

means for delivering a flow of breathing gas to a patient during an inspiratory phase of a breath cycle; and

means for declaring disconnection of the patient tubing system has occurred if a desired flow target is greater than or equal to a maximum flow threshold, and the duration of a current inspiration is greater than or equal to a maximum allowed spontaneous inspiration time.

21. (Amended) [The system of Claim 17,] A system for detecting disconnection of a patient tubing system of a pneumatically driven, electronically controlled ventilator system used to provide breathing gas to a patient, an exhalation phase of a breath cycle having a plurality of control intervals, comprising:

means for determining an onset of an exhalation phase of said breath cycle;

means for monitoring exhalation flow and pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle;
and

wherein said tubing system includes an exhalation line, and said means for

monitoring exhalation flow and pressure in the patient tubing system comprises a flow sensor connected to said exhalation line for measuring exhalation flow from the beginning of an inspiration to the beginning of an exhalation, means for determining an exhalation volume from the sensed flow from the beginning of the inspiration to the beginning of the exhalation, and means for declaring disconnection of the patient tubing system has occurred if the exhalation volume is less than the integral of the net flow from the beginning of inspiration to the beginning of exhalation with respect to time, multiplied by a proportional factor and a disconnection sensitivity factor, for three consecutive breaths.